ACADM gene

acyl-CoA dehydrogenase, C-4 to C-12 straight chain

Normal Function

The *ACADM* gene provides instructions for making an enzyme called medium-chain acyl-CoA dehydrogenase (MCAD). This enzyme functions within mitochondria, the energy-producing centers in cells. MCAD is essential for fatty acid oxidation, which is the multistep process that breaks down (metabolizes) fats and converts them to energy.

MCAD is required to metabolize a group of fats called medium-chain fatty acids. These fatty acids are found in foods and body fat and are produced when larger fatty acids are metabolized. Fatty acids are a major source of energy for the heart and muscles. During periods without food (fasting), fatty acids are also an important energy source for the liver and other tissues.

Health Conditions Related to Genetic Changes

medium-chain acyl-CoA dehydrogenase deficiency

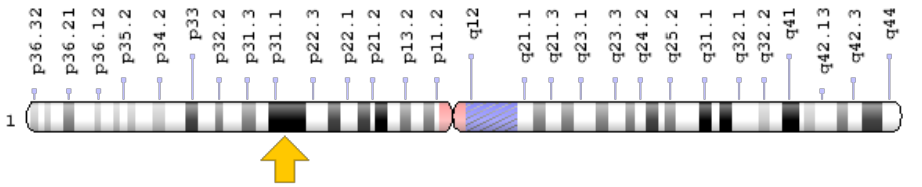
More than 80 mutations in the *ACADM* gene have been found to cause medium-chain acyl-CoA dehydrogenase (MCAD) deficiency. Many of these mutations change single protein building blocks (amino acids) in the MCAD enzyme. The most common change replaces the amino acid lysine with the amino acid glutamic acid at position 304 in the enzyme (written as Lys304Glu or K304E). This mutation and other amino acid substitutions alter the enzyme's structure, severely reducing or eliminating its activity. Other types of mutations lead to an abnormally small and unstable enzyme that cannot function.

With a shortage (deficiency) of functional MCAD enzyme, medium-chain fatty acids are not metabolized properly. As a result, these fats are not converted to energy, which can lead to some features of this disorder such as lack of energy (lethargy) and low blood sugar (hypoglycemia). Medium-chain fatty acids or partially metabolized fatty acids may build up in tissues and damage the liver and brain. This abnormal buildup causes the other signs and symptoms of MCAD deficiency.

Chromosomal Location

Cytogenetic Location: 1p31.1, which is the short (p) arm of chromosome 1 at position 31.1

Molecular Location: base pairs 75,724,347 to 75,763,679 on chromosome 1 (Homo sapiens Annotation Release 108, GRCh38.p7) (NCBI)



Credit: Genome Decoration Page/NCBI

Other Names for This Gene

- ACAD1
- ACADM_HUMAN
- MCAD
- MCADH

Additional Information & Resources

Educational Resources

- Biochemistry (fifth edition, 2002): The Utilization of Fatty Acids as Fuel Requires Three Stages of Processing
  https://www.ncbi.nlm.nih.gov/books/NBK22581/

GeneReviews

- Medium-Chain Acyl-Coenzyme A Dehydrogenase Deficiency
  https://www.ncbi.nlm.nih.gov/books/NBK1424

Genetic Testing Registry

- GTR: Genetic tests for ACADM
  https://www.ncbi.nlm.nih.gov/gtr/all/tests/?term=34%5Bgeneid%5D

Scientific Articles on PubMed

- PubMed
  https://www.ncbi.nlm.nih.gov/pubmed?term=%28ACADM%5BTIAB%5D%29+OR+%28%28MCAD%5BTIAB%5D%29+OR+%28MCADH%5BTIAB%5D%29+OR+%28medium-chain+acyl-CoA+dehydrogenase%5BTIAB%5D%29%29+AND+%28%28Genes%5BMH%5D%29+OR+%28Genetic+Phenomena%5BMH%5D%29%29+AND+english%5Bla%5D+AND+human%5Bmh%5D+AND+%22last+1440+days%22%5Bdp%5D

OMIM

- ACYL-CoA DEHYDROGENASE, MEDIUM-CHAIN
  http://omim.org/entry/607008

Research Resources

- ClinVar
  https://www.ncbi.nlm.nih.gov/clinvar?term=ACADM%5Bgene%5D
- HGNC Gene Family: Acyl-CoA dehydrogenase family
  http://www.genenames.org/cgi-bin/genefamilies/set/974
- HGNC Gene Symbol Report
  http://www.genenames.org/cgi-bin/gene_symbol_report?q=data/hgnc_data.php&hgnc_id=89
- NCBI Gene
  https://www.ncbi.nlm.nih.gov/gene/34
- UniProt
  http://www.uniprot.org/uniprot/P11310

Sources for This Summary

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